

UNDERGROUND STORAGE TANK SYSTEM SITE INVESTIGATION OUTLINE



NATURAL RESOURCES AND ENVIRONMENTAL
PROTECTION CABINET
DIVISION OF WASTE MANAGEMENT
UNDERGROUND STORAGE TANK BRANCH
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601
(502) 564-6716
(800) 928-4273

October 1995

The Natural Resources and Environmental Protection Cabinet does not discriminate on the basis of race, color, national origin, sex, age, religion, or disability. Upon request, the cabinet provides reasonable accommodations including auxiliary aids and services necessary to afford an individual with a disability an equal opportunity to participate in all services, programs, and activities.

UNDERGROUND STORAGE TANK SYSTEM SITE INVESTIGATION OUTLINE

**Natural Resources and Environmental Protection Cabinet
Division of Waste Management
Underground Storage Tank Branch
14 Reilly Road
Frankfort, Kentucky 40601
(502) 564-6716
(800) 928-4273**

INTRODUCTION

Owners and operators shall perform a site investigation that will determine the full extent of contamination into the soils, surface water, air, sediment, groundwater, or bedrock in accordance with Kentucky Administrative Regulations (KAR) Title 401, Chapter 42:060. The Cabinet shall require a site investigation if contamination levels exceed those outlined in 401 KAR 42:080 for regulated petroleum underground storage tank (UST) systems or if contamination levels exceed those outlined in 401 KAR 42:060 or 42:070 for regulated non-petroleum UST systems. Refer to 401 KAR 42:011 for UST system(s) excluded from this outline.

For definition of terms used within this outline, refer to 401 KAR 42:005.

The completed site investigation report shall document the full extent of contamination, and shall be submitted to the UST Branch within one hundred eighty (180) days from the date of the confirmed release. Monthly detailed status update reports shall be submitted regarding all site activities conducted.

The site investigation report, including the checklist, shall be completed and signed by a Professional Engineer (P.E.) registered with the Kentucky Board of Registration for Professional Engineers and Land Surveyors, or a Professional Geologist (P.G.) registered with the Kentucky Board of Registration for Professional Geologists.

Section 1.0 to Section 13.0 of this outline provides a general approach for preparing a site investigation report. Some sites have unique features that may require additional information. This outline is only intended to provide the minimum requirements for a site investigation.

1.0 OVERVIEW / CONCLUSIONS

- 1.1 Provide a brief and concise overview of all information contained in the report.
- 1.2 Provide a brief description of the site investigation activities covered by the report that includes the degree of soil, surface water, air, sediment, groundwater, or bedrock contamination encountered and any potential sensitive receptors and potential exposure pathways.

2.0 SITE IDENTIFICATION AND LOCATION

- 2.1 Provide the site name, location, and the facility identification number.
- 2.2 Provide a topographic map depicting the location of the site. The map shall also indicate the surrounding properties and the nearest town, city, or community. Provide the USGS topographic quadrangle name in which the site is located.
- 2.3 Provide a detailed site-specific map. The site map shall illustrate tank and piping locations, all sampling locations, depth of all tank pits, property boundaries, topography, adjacent properties, and any other pertinent features of the site. The map shall also include underground utility trenches (to scale, indicating the type of service and the depth of trench). The map shall be to scale and include a north arrow and legend.
- 2.4 Provide the longitude and latitude for all tank pits located on the facility property.
- 2.5 Provide original site photographs with descriptive captions in the original Site Investigation Report submitted to the Cabinet. The use of color photocopies of the original photographs will be acceptable in any additional copies of the Site Investigation Report required to be submitted.
- 2.6 Provide information on population and the use of the land both on site and surrounding the site.

3.0 SITE HISTORY

- 3.1 Provide the location of the property including the street address, city, and county.
- 3.2 Provide the property owner's name, address, and telephone number.
- 3.3 Provide the facility operator's name, address, and telephone number--if different than owner's.
- 3.4 Provide a summary of the commercial and private activities that have been conducted at the site.
- 3.5 Provide a chronological description of all investigatory and corrective action work conducted to date.
- 3.6 Provide a summary on the climatological conditions from available sources (e.g. The United States Department of Agriculture Soil Conservation Service's Soil Survey for counties in Kentucky) for the site.

4.0 UNDERGROUND STORAGE TANK (UST) SYSTEM HISTORY

- 4.1 Provide all available information regarding the age and size of all past and present underground storage tank (UST) systems, the types of product currently and previously contained in each system, the type of material of which all tanks and piping are constructed, the date all tank systems were last in operation, the condition of all tanks and piping if they were removed, the dates of the tank and piping removals, any system repair history, and the date of discovery of any release. A written explanation shall be provided for the omission of any item.
- 4.2 Provide a copy of leak detection records for three (3) months prior to the discovery of the release or the discontinued use of the tanks or piping, whichever is applicable. If records are not available, a written explanation is required. If the records have previously been submitted they will not be required to be resubmitted, but a statement indicating when and in what report the information was previously submitted shall be indicated in this section of the site investigation report.
- 4.3 Provide data on the nature and estimated quantity of the release.

5.0 GROUNDWATER USAGE AND SENSITIVITY

- 5.1 Provide information concerning the quality and usage of groundwater within a minimum radius of 300 meters (984 feet) from the site. At a minimum, identify all water well users (e.g. public water supply wells, private wells, agriculture and livestock wells, industrial wells, water supply springs, wellhead protection areas, etc.) located within this radius. Include a map depicting each location. The map shall be to scale and include a north arrow and legend.
- 5.2 Provide documentation indicating if the site is located in a carbonate bedrock setting. If so, refer to Section 10.0 Carbonate Bedrock Groundwater Systems. If not, all of the following information shall be submitted to the UST Branch:
 - a. A 7.5 Minute USGS Topographic Map indicating the location of the facility in order to demonstrate that no carbonate bedrock surface features (e.g. sinkholes, sinking or disappearing streams, blue holes, springs, or any other topographic feature which would indicate carbonate bedrock groundwater flow) are located within 300 meters (984 feet) of the UST system(s). The portion of the topographic map submitted shall indicate the name of the map, latitude, longitude, and other pertinent information for the area surrounding the facility.
 - b. A 7.5 Minute USGS Geologic Quadrangle Map indicating the location of the facility in order to demonstrate that the facility is not in an area with geologic formations composed of limestone or dolostone. The portion of the geologic quadrangle map submitted shall indicate the quadrangle name, latitude, longitude, and other pertinent information surrounding the facility.

6.0 SURFACE WATER USAGE

Provide information concerning the usage of the surface waters within a minimum radius of 300 meters (984 feet) from the UST system(s) located on the site. At a minimum, identify all surface water users (e.g. drinking water intake and distribution points, recreational areas, water usage springs, and agricultural or livestock usage, etc.) located within this radius. Include a map depicting each location. The map shall be to scale and include a north arrow and legend.

7.0 FIELD INVESTIGATIONS

Provide documentation indicating that the field investigation was conducted in a manner to characterize the site geology, site hydrogeology, to determine the full extent of the contamination, and analytical levels of contamination for soil, surface water, air, sediment, groundwater, or bedrock.

The documentation shall also indicate the direction(s) of groundwater flow, hydraulic gradient(s), migration pathways, the elevation of groundwater, etc. Short-term and seasonal variations in these groundwater parameters shall be documented.

- 7.1 Provide a list of all field activities conducted during this investigation. The list shall, at a minimum, include total number and locations of borings, total number of monitoring wells, field soil, air, sediment, or water samples indicating all depths, locations, field screening results, and laboratory analyses for water, air, sediment, or soil. A complete copy of the Kentucky Monitoring Well Record Form #DEP 8043, as required in 401 KAR 6:310, shall be submitted to the Underground Storage Tank Branch for every monitoring well installed.
- 7.2 Provide a summary of drilling procedures and activities. The summary shall, at a minimum, include the type of equipment used, the drilling methods used, and the sample collection and preservation methods. The method of drilling chosen should reach the necessary depths without inducing migration of the contamination or diluting the contaminant concentration.
- 7.3 Provide a summary describing the monitoring well installation, completion, and development procedures; water quality observation; water level elevation; and sampling procedures. The documentation shall, at a minimum, include water quality observations and static water level measurements, etc. Include this in a table format. Attempt to complete all monitoring wells such that the screened interval intersects the surface of the groundwater table and accounts for seasonal fluctuations in the static water level.
- 7.4 Provide a summary indicating that all borings or monitoring wells were extended at least three (3) feet below the bottom of the deepest UST system excavation located on site or to the bedrock. If bedrock is encountered less than three (3) feet below the deepest UST system excavation then a groundwater sample shall be collected from the hydrogeologically downgradient area most likely to be affected by a release from the UST system, except for the conditions listed in Section 10.1. The depth of the deepest UST system shall be determined from construction or as built plan elevations, if available, or by surveying the site to determine the lowest elevation of the deepest UST system excavation located on site.

- 7.5 Provide a summary indicating that soil borings were extended downward through all soils that are determined to be contaminated as indicated by properly calibrated field instrumentation. If soil is encountered at a depth that does not appear to be contaminated, confirmatory laboratory analysis is required to verify that the vertical extent of the release has been determined. Additionally, if groundwater is not encountered and the boring does not extend to bedrock, a soil sample shall be collected from the depth of the boring that yields the highest field screening result.
- 7.6 Provide analysis results of a soil sample collected directly above the soil/groundwater interface and the depth of the boring that yields the highest field screening result, if groundwater was encountered in the boring. Similarly, if bedrock is encountered, provide analysis results of a soil sample collected directly above the soil/bedrock interface and analysis results of a sample collected from the depth of the boring that yields the highest field screening result.
- 7.7 Provide a summary indicating that the monitoring wells were adequately developed and purged to obtain a sample that is representative of the groundwater at the site. Note that, unless installed by a certified monitoring well driller in accordance with 401 KAR 6:310, piezometers shall not be used for the extraction of groundwater for any sampling purpose.
- 7.8 Provide a written summary describing the strategy and logic for the placement of the soil boring and/or monitoring well.
- 7.9 Provide documentation indicating proper operation and quality control procedures used during the operation of the field instrumentation.
- 7.10 Provide a summary describing the well tagging procedures. Provide a table which matches the monitoring well number to the well tag site investigation number. Provide a complete copy of the Kentucky Monitoring Well Record form #DEP 8043 for every monitoring well installed.
- 7.11 Provide a site map depicting exact locations of soil borings and monitoring wells. The map shall be to scale and include a north arrow and legend.
- 7.12 Provide documentation indicating that soil borings are properly abandoned within forty-eight (48) hours from the sampling date or the date of determination that the soil boring is not going to be converted into a groundwater monitoring well. Properly abandoned refers to being sealed with cement/bentonite or bentonite from bottom to top, in a manner to prevent communication of surface water and groundwater through the boring and to prevent communication between two or more water-bearing zones through the boring.
- 7.13 Provide documentation indicating that the direct-push borings are properly abandoned immediately after obtaining a sample. Properly abandoned refers to being sealed with cement/bentonite or bentonite from bottom to top, in a manner to prevent communication of surface water and groundwater through the boring and to prevent communication between two or more water-bearing zones through the boring.

- 7.14 Provide documentation indicating that monitoring wells are properly abandoned within thirty (30) days from the date of determination that the well is unsuitable for use as a monitoring well or within thirty (30) days of receiving a no further action letter from the Cabinet. Properly abandoned refers to being sealed with cement/bentonite or bentonite from bottom to top, in a manner to prevent communication of surface water and groundwater through the well or boring and to prevent communication between two or more water-bearing zones through the well or boring.

8.0 MONITORING WELL CONSTRUCTION

Provide documentation indicating that all monitoring wells were properly drilled, constructed, altered, and abandoned in accordance with 401 KAR 6:310. The documentation shall indicate that the following requirements were conducted:

- 8.1 Precautions shall be taken during drilling and construction of monitoring wells to avoid introducing contaminants into a borehole. Only potable water shall be used in drilling monitoring wells, unless otherwise approved by the UST Branch. Drilling muds shall not be used except with prior approval of the UST Branch. Air systems and drilling lubricants shall not introduce contaminants into the boreholes.
- 8.2 Decontamination (see Section 11.1 of this outline) of all equipment to be placed into a boring shall be performed before use at the site and between boreholes. Where possible, hydrogeologically upgradient wells shall be drilled first.
- 8.3 Monitoring wells shall be cased as follows:
- (a) Isolate water-bearing units that are sampled at each well to maintain the integrity of the monitoring well borehole.
 - (b) Use a minimum casing diameter of two (2) inches. A four (4) inch or greater minimum casing diameter will be required if the well is to be used for recovery of free-phased product or removal of water for remediation purposes (unless approved by the UST Branch).
 - (c) Use screens and appropriate gravel (or sand packing where necessary) to enable collection of groundwater samples at appropriate depths in order to intersect the surface of the groundwater table and account for seasonal fluctuations in the static water level.
 - (d) Allow the casing to protrude at least one (1) foot above the ground surface, or allow a flush-mounted manhole casing where necessary. Monitoring well casings shall have a locked cap.
 - (e) Provide a drill hole diameter that is a minimum of four (4) inches larger than the outside diameter of the well casing.
 - (f) Produce an annular space above the sampling depth that is sealed to prevent contamination of samples and the groundwater.

- (g) If plastic casing is used, thread and gasket-seal it to preclude potential sample contamination from solvent welded joints, unless otherwise approved by the UST Branch.

8.4 Monitoring well casings shall be enclosed in a protective cover that shall:

- (a) be sufficient to reliably protect the well from damage (this shall include a protective barrier around the well);
- (b) be grouted and placed with a cement collar below the frost line to hold it firmly in position, unless otherwise approved by the UST Branch;
- (c) be numbered and painted in a highly visible color;
- (d) protrude at least one (1) inch higher than the monitoring well casing;
- (e) be made of steel or any other material of equivalent strength.

8.5 Each monitoring well shall have a concrete pad extending two (2) feet around the well at least four (4) inches thick and sloped away from the well or the flush-mounted manhole.

8.6 Monitoring wells shall be properly abandoned within thirty (30) days from the date of determination that the monitoring well is unsuitable for use as a monitoring well or within thirty (30) days of receiving a no further action letter from the Cabinet. Properly abandoned refers to being sealed with cement/bentonite or bentonite from bottom to top, in a manner to prevent communication of surface water and groundwater through the well or boring and to prevent communication between two or more water-bearing zones through the well or boring.

8.7 All monitoring wells shall be properly drilled, constructed, altered, tagged, abandoned, reported, etc., in accordance with 401 KAR 6:310. Contact the Groundwater Branch of the Division of Water at (502) 564-3410, for more information regarding well driller certification.

9.0 SITE GEOLOGY / HYDROGEOLOGY

9.1 Provide a description of the local and regional geology, hydrogeology and surface water hydrology based upon reasonably current scientific publications.

9.2 Provide a description of the site geology and hydrogeology based upon information obtained during soil boring and monitoring well drilling activities.

9.3 Provide a sufficient number of cross sections of the site that correspond to soil borings or monitoring wells, and adequately illustrate the variation of the geology and the flow conditions of the hydrogeology of the site. Seasonal and short-term variations of groundwater flow conditions shall be depicted. Cross sections shall be drawn to scale (vertical and horizontal) with a legend. Accurately label all data points and cross-section lines on the map.

- 9.4 Provide a map depicting static water level measurements, direction of groundwater flow, and the hydraulic gradient. Accurately label all data points on the map. Water-level measurements shall reflect static conditions, and all wells shall be measured on the same day. Include a north arrow and legend on all maps.
- 9.5 Provide drilling logs with total depth, detailed lithologic descriptions, and field screening results corresponding to depths measured. Drilling logs shall, at a minimum, include a detailed description of the thickness, color, texture, grain sorting, grain size, and grain shape of the materials encountered; a description of lenses or thin layers encountered; and the depth to water and elevation of the top of the well. Include any field observations such as odors and moisture changes.
- 9.6 Provide the monitoring well logs or schematic construction diagrams. The diagrams shall, at a minimum, accurately depict depth of the screen interval, blank casing interval, filter pack, bentonite seal thickness, and grout seal thickness. Describe the procedures followed to ensure the integrity of the wells (e.g. locking caps, concrete pads).

10.0 CARBONATE BEDROCK GROUNDWATER SYSTEMS

- 10.1 Provide documentation indicating that the drilling activities, if conducted, were terminated when bedrock was encountered in carbonate bedrock areas with potential subsurface solution channel flow. Site investigation activities shall initially include monitoring wells being placed into unconsolidated material only. After the evaluation of the wells in the unconsolidated material and the hydrogeologic investigation have been completed, deeper bedrock wells may be required on a site-specific basis. When bedrock wells are required, special installation techniques which prevent the cross-contamination of aquifers shall be performed.
 - 10.2 Provide documentation indicating the contamination to the soils, air, sediment, and perched water was identified and remediation was begun as quickly as possible to prevent migration of contamination into the carbonate bedrock aquifer system.
 - 10.3 Provide documentation indicating that a Professional Geologist (P.G.) registered with the Kentucky Board of Registration for Professional Geologist, or a Professional Engineer (P.E.) registered with the Kentucky Board of Registration for Professional Engineers and Land Surveyors undertook a hydrogeologic survey, mapping all relevant features such as sinkholes, sinking streams, caves, and all springs in the locale surrounding the site. Contact the Groundwater Branch of the Kentucky Division of Water at (502)564-3410 to obtain any existing information on carbonate bedrock drainage near the site.
 - 10.4 Provide documentation indicating that a petroleum vapor survey of all buildings and utility lines around the UST system facility that have the potential to be affected by vapors was performed. If the presence of petroleum vapors are detected, they shall be eliminated as soon as possible.
- NOTE: A dye-trace study may be requested after the UST Branch's review of the site investigation report.

11.0 ANALYTICAL RESULTS

- 11.1 Provide documentation indicating the recognized methods, pursuant to 40 CFR 260.11, in accordance with US EPA SW-846, was followed for sample collection, sample preservation, sampling equipment, decontamination procedures, sample containers, sample size, and maximum sample holding times (see Table C). Samples shall be delivered to an appropriate materials testing laboratory for the analysis required (see Tables A and B). The date the sample was collected, received, and analyzed by the laboratory, as well as all the US EPA SW-846 methods used to extract and analyze the sample, shall be indicated on the laboratory report. The laboratory report shall follow the US EPA SW-846 requirements.
- 11.2 Provide chain-of-custody documentation that identifies who has had possession of the sample, the time of possession, and where the sample has been from the time of collection until the laboratory accepts it. Chain-of-custody procedures shall be followed to ensure the validity of all samples. If the chain-of-custody is not maintained, e.g. if someone leaves a sample unattended, then the integrity of the sample is compromised and may be rejected by the Cabinet. The chain-of-custody shall be developed as indicated by US EPA SW-846 requirements and shall be attached to all sample analyses results submitted.
- 11.3 Provide a map indicating the level of concentration of each major contaminant constituent and the locations of sampling points. Accurately label all sampling locations and concentrations. The map shall be drawn to scale and include a north arrow and legend.
- 11.4 Provide an isopach map depicting the extent and thickness of free-product, if encountered. Free-floating product recovery shall be conducted immediately upon discovery to minimize the spread of the release, and any fume, vapor, or odor problems shall be eliminated immediately pursuant to 401 KAR 42:060 which incorporates 40 CFR 280.64 by reference.
- 11.5 Provide a list and explain any anomalies detected in the analyses.
- 11.6 Provide results of all groundwater sample analyses using the UST Groundwater Sample Analyses Form (DEP2013/09/05/95) for facilities required to sample groundwater. The UST Groundwater Sample Analyses Form (DEP2013/09/05/95) shall be submitted to the UST Branch.

12.0 WASTE HANDLING PROCEDURES

Provide a summary of the handling and storage of waste generated during the field investigation, and submit documentation regarding the proper handling and proper disposal of the waste (e.g. chain-of-custody, waste manifest, receipts, etc.). If wastes are determined to be hazardous, contact the Hazardous Waste Branch, Division of Waste Management at (502) 564-6716 or (800) 923-4273, for additional requirements pertaining to waste disposal, manifesting, registration, etc.

13.0 HEALTH AND SAFETY

Provide the standard operating health and safety plan that was followed throughout the course of the investigation. If the health and safety plan has been previously submitted, and would not require any modification, it will not be required to be resubmitted, but a statement indicating when and in what report the information was previously submitted shall be indicated in this section of the site investigation report.

14.0 SUBMITTAL OF THE FINAL REPORT

One (1) original and one (1) copy of the site investigation report shall be submitted by the required date to the UST Branch. Include the facility identification number on the first page of each copy.

15.0 ADDITIONAL SITE CHARACTERIZATION

In some situations additional site information may be required to determine the full extent of contamination. Situations may include:

- 15.1 A need develops for better delineation of the full extent of the release.
- 15.2 Pertinent site characteristics are discovered after the initial site characterization efforts.
- 15.3 The site investigation is intended to determine the full extent of a release, therefore if the investigation of the upper water-bearing unit cannot determine the full extent of contamination to the groundwater, then an investigation of the lower water-bearing unit may be required. The drilling method and location chosen to investigate a lower water-bearing unit shall reach the necessary depth without inducing the migration of contamination.
- 15.4 The Cabinet reserves the right to require additional information. The owner/operator will be contacted in writing if more information is required.

16.0 OTHER CONSIDERATIONS

- 16.1 Review the Underground Storage Tank System Closure Outline, which is incorporated by reference in 401 KAR 42:070 (dated October 1995) for additional sampling information.
- 16.2 Review the Petroleum Underground Storage Tank System Facility Classification Outline, which is incorporated by reference in 401 KAR 42:080 (dated October 1995) for additional information.

- 16.3 Review the Underground Storage Tank System Corrective Action Plan Outline, which is incorporated by reference in 401 KAR 42:060 (dated October 1995) for additional information.
- 16.4 Review the Pre April 18, 1994 Underground Storage Tank (UST) System Voluntary Closure Outline, which is incorporated by reference in 401 KAR 42:071 (dated October 1995) for additional information.
- 16.5 Pursuant to 401 KAR 42:060, which adopts the requirements of 40 CFR 280.66, owners and operators may, in the interest of minimizing environmental contamination and promoting more effective cleanup, begin cleanup of soil and groundwater before the corrective action plan is accepted, provided the UST Branch is notified in writing of the intention to begin cleanup. The UST Branch may impose conditions on the implementation of the interim actions. Owners/operators should be aware that certain types of corrective action (e.g. injection wells or recovery/pumping wells) or lack of corrective action may redistribute the release into areas that were not previously effected.
- 16.6 A soil vapor gas survey or other accepted field screening techniques may be used to help determine the full extent of a release. Laboratory analysis by appropriate SW-846 test methods shall be required for the final phase of the investigation. All information pertaining to the soil vapor gas survey shall be submitted with the site investigation report.
- 16.7 The type of corrective action being considered may require additional or expanded laboratory testing or other additional information.
- 16.8 For information about financial assistance for remediation, contact the Petroleum Storage Tank Environmental Assurance Fund Commission (PSTE AFC) at 911 Leaward Drive, Frankfort, Kentucky 40601 or phone (502) 564-5981 or (800) 928-7782.
- 16.9 For information about the Kentucky Monitoring Well Record form #DEP 8043 or abandonment of monitoring wells, contact the Groundwater Branch, Division of Water, 14 Reilly Road, Frankfort, Kentucky 40601 or phone (502) 564-3410.

17.0 FULL EXTENT OF CONTAMINATION DETERMINED

When the full extent of the release has been determined and the site investigation report has been reviewed and accepted by the UST Branch, a plan for corrective action may be requested. Refer to the UST System Corrective Action Plan Outline incorporated by reference in 401 KAR 42:060 (dated October 1995) for guidance.

FINAL SITE INVESTIGATION REPORT REVIEW CHECKLIST

Site Name _____ County _____

Location _____ U.S.T. I.D. # _____

Instructions

Place the page # next to each item included in the site investigation report. Address all items in writing within each specific section in the report. The completed checklist shall be submitted to the UST Branch with each copy of the final report in order to expedite review of the site investigation report.

Page

1.0 Overview / Comments

- _____ 1.1 Brief and concise overview of all information contained in the report.
- _____ 1.2 Brief description of the site investigation activities covered by the report which includes the degree of soil, surface water, air, sediment, groundwater, or bedrock contamination encountered and any potential sensitive receptors and potential exposure pathways.

2.0 Site Identification and Location

- _____ 2.1 Site name, location, facility identification number
- _____ 2.2 Site topographic map for exact location of the site (to scale, north arrow, legend, quadrangle name)
- _____ 2.3 Detailed site-specific map for location and information for the site (to scale, north arrow, legend)
- _____ 2.4 Longitude and latitude for all tank pit areas
- _____ 2.5 Site photographs with descriptive captions
- _____ 2.6 Information on populations and use of land on site and surrounding the site

3.0 Site History

- _____ 3.1 Site street address, city, and county
- _____ 3.2 Property owner's name, address and telephone number
- _____ 3.3 Facility operator's name, address and telephone number
- _____ 3.4 Summary of commercial and private activities at the site
- _____ 3.5 Chronological description of all investigatory and corrective action work conducted to date
- _____ 3.6 Summary of the climatological conditions

4.0 Underground Storage Tank History

- _____ 4.1 Underground storage tank and piping information (all tanks and piping past/present, age, size, contents, construction, tank and piping removal dates, leak discovery dates, repair history, etc.)
- _____ 4.2 Leak detection records for three (3) months prior to the release
- _____ 4.3 Data on nature and estimated quantity of the release

5.0 Groundwater Usage and Sensitivity

- _____ 5.1 Groundwater usage identified within a minimum radius of 300 meters (984 feet) (public, private, water wells, etc). Map to scale with legend
- _____ 5.2 Indication of whether the site is located in a carbonate bedrock setting

6.0 Surface Water Usage

- _____ 6.0 Indication of surface water usage within a minimum radius of 300 meters (984 feet) (water intake and distribution points, recreational areas, springs, agricultural or livestock usage, etc.) Map to scale with legend

SITE INVESTIGATION REPORT REVIEW CHECKLIST PAGE 2

7.0 Field Investigations

- _____ 7.1 List of all field activities conducted during this investigation, number of soil borings with total depths, number of monitoring wells installed with total depths, a complete copy of the Kentucky Monitoring Well Record Form #DEP 8043 for every monitoring well installed
- _____ 7.2 Summary of drilling activities and procedures (equipment used, drilling methods, sample collection)
- _____ 7.3 Description of monitoring well installation, completion, development, sampling procedures,
- _____ 7.4 Information indicating that borings and monitoring wells extend at least three (3) feet below the bottom of the deepest UST system excavation on the site or to the bedrock
- _____ 7.5 Information indicating where soil samples were collected
- _____ 7.6 Information indicating if groundwater samples were collected
- _____ 7.7 Information indicating that the monitoring wells were adequately developed and purged
- _____ 7.8 Summary describing the strategy and logic for placement of borings/wells
- _____ 7.9 Documentation indicating proper operation and quality control procedures of the field instrumentation
- _____ 7.10 Summary describing the well tagging procedures
- _____ 7.11 Site map for locations of soil borings and monitoring wells (to scale with legend)
- _____ 7.12 Indication of how soil-borings were properly abandoned
- _____ 7.13 Indication of how direct-push borings were properly abandoned
- _____ 7.14 Indication of how monitoring wells were properly abandoned

8.0 Monitoring Well Construction

- _____ 8.1 Description of what precautions were taken during drilling and construction of monitoring wells
- _____ 8.2 Indication of how proper decontamination procedures were followed
- _____ 8.3 Indication of how monitoring wells were cased properly (a - g)
- _____ 8.4 Indication of how monitoring wells are properly protected (a - e)
- _____ 8.5 Indication of how monitoring wells have properly constructed concrete pads
- _____ 8.6 Indication of how monitoring wells have been properly abandoned
- _____ 8.7 Indication of whether monitoring wells were drilled, constructed, altered, tagged, abandoned, reported, etc. by a certified well driller

9.0 Site Geology / Hydrogeology

- _____ 9.1 Description of local and regional geology and hydrology based on scientific publications
- _____ 9.2 Description of site geology and hydrology based on information from soil borings and monitoring well drilling
- _____ 9.3 Geological cross sections depicting lithologies, contaminant profiles, and water table configuration (to scale, horizontal and vertical, with legend)
- _____ 9.4 Site map depicting water table surface with static levels, direction of groundwater flow and hydraulic gradient (to scale with legend)
- _____ 9.5 Drilling logs provided depicting total depth, lithologies, and field screening results
- _____ 9.6 Monitoring well construction diagrams with depth and length of screen, blank casing, filter pack, bentonite seal, grout seal, Discussion on the integrity of the wells, etc

10.0 Carbonate Bedrock Groundwater Systems

- _____ 10.1 Indication of whether drilling was terminated at bedrock in carbonate bedrock areas with potential subsurface solution channel flow
- _____ 10.2 Documentation of remediation of soils, air, sediment, and perched water that was affected by the release in order to prevent contamination from entering the carbonate bedrock aquifer system
- _____ 10.3 Information received from the Groundwater Branch, map depicting locations of sinkholes, sinking streams, caves and all spring locations
- _____ 10.4 Survey of all potentially affected buildings and utility lines

SITE INVESTIGATION REPORT REVIEW CHECKLIST PAGE 3

11.0 Analytical Results

- _____ 11.1 Discussion of recognized methods and method detection limits, sample preservation, sampling equipment, decontamination procedures, sample containers, sample size, sample holding times, etc
- _____ 11.2 Chain of Custody records
- _____ 11.3 Concentration map for each constituent
- _____ 11.4 Free-product thickness isopach map, methods used to recover free-product
- _____ 11.5 Explanation of anomalies detected in the analyses
- _____ 11.6 UST Groundwater Analyses Form (DEP2013/09/05/95) included for all groundwater samples collected and analyzed

12.0 Waste Handling Procedures

- _____ 12.0 Summary for handling, storage and proper disposal of waste generated during investigation

13.0 Health and Safety

- _____ 13.0 Standard operating health and safety plan

CERTIFICATION OF THE SITE INVESTIGATION REPORT

Under the requirements of KRS Chapter 322 and 322A, this Site Investigation Report shall be completed and signed by a Professional Engineer (P.E.) registered with the Kentucky Board of Registration for Professional Engineers and Land Surveyors, or a Professional Geologist (P.G.) registered with the Kentucky Board of Registration for Professional Geologist.

Signature _____ Date _____

Name and Title (Type or Print) _____

Registration Number, Date and Seal _____

The undersigned, first being duly sworn, states that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals responsible for obtaining the information, I believe the submitted information is true, accurate and complete. The undersigned further acknowledges that KRS 224.99-010 provides for penalties for submitting false information.

Company Name _____

Name and Title of Individual Whose

Signature Appears Below _____

Signature* _____

Date of Signature _____

Subscribed and Sworn to before me by _____

This the _____ Day of _____, 19____.

Notary Public _____

My Commission Expires _____

Location of Commission _____

*NOTE: If individual signing is someone other than the president or secretary of a corporation, attach a notarized copy of power of attorney, or resolution of board of directors which grants individual the legal authority to represent the company. (Does not apply to a single proprietorship or partnership.)

Table A
Analytical Requirements for Soil Samples

Product stored in UST System	Required Analysis	Acceptable Method	Maximum Acceptable Reporting Limit
Gasoline, Kerosene, or Jet Fuel	BTEX	Method 5030 in conjunction with SW-846 8240, 8260, 8020, or 8021	B: < 0.01 ppm T: < 0.7 ppm E: < 0.9 ppm X: < 5.0 ppm
Diesel or regulated Heating Oil	PAH	Method 3540 or 3550 in conjunction with SW-846 8100, 8270, or 8310	Ch: < 15 ppm B(a)A: < 0.15 ppm c PAH: < 0.3 ppm n PAH: < 3.0 ppm NAP: < 1.0 ppm
Waste Oil	PAH	Method 3540 or 3550 in conjunction with SW-846 8100, 8270, or 8310	Ch: < 15 ppm B(a)A: < 0.15 ppm c PAH: < 0.3 ppm n PAH: < 3.0 ppm NAP: < 1.0 ppm
	Total Lead	SW-846 7420, 7421, or 6010	< 50 ppm or less than established background
New Oil	PAH	Method 3540 or 3550 in conjunction with SW-846 8100, 8270, or 8310	Ch: < 15 ppm B(a)A: < 0.15 ppm c PAH: < 0.3 ppm n PAH: < 3.0 ppm NAP: < 1.0 ppm
Other Petroleum or Non-Petroleum	Contact the UST Branch		

BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (total)
 PAH: Polynuclear Aromatic Hydrocarbons
 Ch: Allowable level individually for Chrysene
 B(a)A: Allowable level individually for Benzo(a)anthracene
 c PAH: Maximum Acceptable Reporting Limit Individually for Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene
 n PAH: Maximum Acceptable Reporting Limit Individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene and Pyrene
 NAP: Naphthalene
 ppm: part per million (mg/kg)

Table B

Analytical Requirements for Water Samples

Product stored in UST System	Required Analysis	Acceptable Method	Maximum Acceptable Reporting Limit
Gasoline, Kerosene, or Jet Fuel	BTEX	Method 5030 in conjunction with SW-846 8240, 8260, 8020, or 8021	B: < 0.005 ppm T: < 1.0 ppm E: < 0.7 ppm X: < 10.0 ppm
Diesel or regulated Heating Oil	c PAH n PAH NAP	Method 3510 or 3520 in conjunction with SW-846 8100, 8270, or 8310	c PAH: < 0.005 ppm n PAH: < 3.0 ppm NAP: < 0.3 ppm
Waste Oil	c PAH n PAH NAP Total Lead	Method 3510 or 3520 in conjunction with SW-846 8100, 8270, 8310 SW-846 7420, 7421, or 6010	c PAH: < 0.005 ppm n PAH: < 3.0 ppm NAP: < 0.3 ppm < 0.015 ppm or less than established background
New Oil	c PAH n PAH NAP	Method 3510 or 3520 in conjunction with SW-846 8100, 8270, 8310	c PAH: < 0.005 ppm n PAH: < 3.0 ppm NAP: < 0.3 ppm
Other Petroleum or Non-Petroleum	Contact the UST Branch		

BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (total)

PAH: Polynuclear Aromatic Hydrocarbons

c PAH: Maximum Acceptable Reporting Limit Individually for Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene

n PAH: Maximum Acceptable Reporting Limit Individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene, and Pyrene

NAP: Naphthalene

ppm: part per million (mg/l)

Table C

Appropriate Containers, Sample Sizes,
Preservation Techniques and Maximum Holding Times*

Parameter	Container Type	Sample Size	Preservation Method	Holding Times (Maximum)
Volatile Organics for Soil (BTEX)	Wide-mouth glass w/ Teflon-lined cap	120 ml or 4 oz.	Cool to 4°C	14 days
Volatile Organics for Water (BTEX)	Two (2) clear glass w/ Teflon-lined cap (VOA)	40 ml or 1 oz.	Add four drops of HCl to ea., Cool to 4°C	14 days
Polynuclear Aromatic Hydrocarbons for Soil (PAH)	Wide-mouth glass w/ Teflon-lined cap	250 ml or 8 oz.	Cool to 4°C	14 days until lab extraction 40 days after lab extraction
Polynuclear Aromatic Hydrocarbons for Water (PAH)	Amber glass w/Teflon-lined cap	1 liter	Cool to 4°C	7 days until lab extraction 40 days after lab extraction
Total Lead for Soil	Wide-mouth glass w/ Teflon-lined cap	500 ml or 16 oz.	Cool to 4°C	180 days
Total Lead for Water	Plastic or glass	500 ml or 16 oz.	Add HNO ₃ until pH is less than 2, cool to 4°C	180 days
Volatile Organics for Sludge (TCLP)	Wide-mouth glass w/ Teflon-lined cap	120 ml or 4 oz.	Cool to 4°C	14 days until lab extraction 14 days after lab extraction
Acid/Base/Neutral for Sludge (TCLP)	Wide-mouth glass w/ Teflon-lined cap	120 ml or 4 oz.	Cool to 4°C	14 days (hold) 7 days until lab extraction 40 days after lab extraction
Metals for Sludge (TCLP)	Wide-mouth glass w/ Teflon-lined cap	500 ml or 16 oz.	Cool to 4°C	180 days until lab extraction 180 days after lab extraction
Mercury for Sludge (TCLP)	Wide-mouth glass w/ Teflon-lined cap	500 ml or 16 oz.	Cool to 4°C	28 days until lab extraction 28 days after lab extraction

* FOR FURTHER INFORMATION REFER TO US EPA SW-846 PUBLICATION.